

DETAILED ACTION

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 12 recites the limitation "'in addition to an upper and a lower drain" in line

2. There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-6 and 8-10 are rejected under 35 U.S.C. 102(b) as being anticipated by Young et al. (US 2003/0226806).

Regarding claim 1

Young teaches a method and device for liquid extraction (i.e. working up a liquid substance) (abstract), where the device uses microchannels and microstructures (i.e. microreactor) (paragraph 0002), where the device can be ran in a continuous manner (paragraph 0006). Also see figures 1-3 and 8-10.

Regarding claims 2-5

Young teaches a channel with a width and depth in one embodiment of about 100 microns (paragraph 0035), which reads on a diameter of about 100 microns, which

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reads on at least 50 microns, on at least 100 microns, on not more than 3000 microns, and also reads on not more than 1000 microns.

Regarding claim 6

Young teaches the use of laminar flow (paragraph 0039).

Regarding claim 8

Young teaches the use of channel structures which aid in the mixing of the fluid (abstract and paragraph 0017 and figure 12).

Regarding claim 9

Young teaches the use of silicon (paragraph 0011).

Regarding claim 10

Young teaches that metal can be used in making the device (paragraph 0052).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.

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4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Young et al. (US 2003/0226806), as applied to claim 1 above, in further view of Gilligan et al. (US 2003/0156995).

Regarding claim 7

Although, Young does not teach the Reynolds number, Young does teach the rest of the limitations of the claims. However, because Gilligan teaches that "The small channels dimensions in the microreactor result in flow with low Reynolds numbers ($<10^3$) and a predominantly laminar flow regime" (paragraph 0007), one of ordinary skill in the art at the time of the invention, would have found it obvious that the Reynolds number is less than 100, absent any evidence to the contrary.

Claims 11-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Young et al. (US 2003/0226806), as applied to claim 1 above.

Regarding claim 11

Although, Young does not teach that the already separated liquid phases flow into a vessel, having both an upper and lower drain to draw the liquids off, Young does show the use of two separate drains exiting the microreactor to draw off the separate phases (see figure 8), and this is seen as merely splitting what was done in one step in the reference to two steps in the instant invention, which is considered to be obvious, absent any evidence of criticality or unexpected results. Further the courts have held that :

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In general, the transposition of process steps, or the splitting of one step into two, where the processes are substantially identical or equivalent in terms of function, manner and result, was held to not patentably distinguish the processes. Ex parte Rubin (POBA 1959) 128 U.S.P.Q. 440, Cohn v. Comr. Pats. (DCDC 1966) 251 F Supp 378, 148 U.S.P.Q. 486.

Regarding claim 12

Young teaches the use of three exits/drains, which reads on an upper a lower, and at least one more (see figure 10).

Regarding claim 13

Although, Young does not teach the use of a plurality of reactors in a series configuration, Young does teach the rest of the limitations of the claims. However, it would have been prima facie obvious to one of ordinary skill in the art at the time of the invention, to use more than one reactor/separator in a series, if the separation results through one pass are not sufficient for the mixture used, and further this is seen as merely splitting what is one step in the reference into two steps in the instant invention. Further still the courts have held that:

In general, the transposition of process steps, or the splitting of one step into two, where the processes are substantially identical or equivalent in terms of function, manner and result, was held to not patentably distinguish the processes. Ex parte Rubin (POBA 1959) 128 U.S.P.Q. 440, Cohn v. Comr. Pats. (DCDC 1966) 251 F Supp 378, 148 U.S.P.Q. 486.

Claims 14 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Young et al. (US 2003/0226806) as applied to claim 1 above, and further in view of Chang et al. (US 2005/0220681).

Regarding claims 14 and 15

Although, Young is silent is to the product being worked up and does not teach the device is useful for working up liquid nitrate esters or nitroglycerol (nitroglycerine), Young does teach the working up of chemical products and the rest of the limitations of the claims. However, because Chang teaches that a person of ordinary skill in the art will appreciate that microreactors are useful for working with compounds such as nitroglycerine (paragraph 0073), it would have been prima facie obvious for one of ordinary skill in the art at the time of invention, to modify the teachings of Young, by using the device to work up nitroglycerine, as suggested by Chang, with a reasonable expectation of success, absent any evidence to the contrary or a showing of unexpected/critical results.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JAMES E. MCDONOUGH whose telephone number is (571)272-6398. The examiner can normally be reached on 8:30am-5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jerry Lorengo can be reached on (571)272-1233. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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/James E McDonough/
Examiner, Art Unit 1793